

12681-002

04-20-11
Draft, Rev. 0

NPPD
Gerald Gentleman and Sheldon Stations
S&L Scope of Work Summary

The following outline of the Sargent & Lundy (S&L) scope of work (SOW) for the evaluation, engineering, procurement and design of multi-pollutant control equipment (MPC) for Gerald Gentleman Station (GGS) and Sheldon Station (SS) has been developed as an interim deliverable in response to the attached NPPD “draft” MPEC Planning Efforts white paper. A detailed S&L proposal based on the scope of work for GGS and SS will be submitted to NPPD in mid-May 2011.

Gerald Gentleman Station Scope of Work

S&L will review the implications of the EPA proposed rules listed on the NPPD draft white paper Attachment A, including consideration of the Greenhouse Gas Tailoring rule, the proposed RCRA coal combustion residue rules, and any additional applicable rules (e.g. for waste water). The specific tasks that will be completed are as follows.

- Review each proposed rule and identify the technically feasible MPCE technology(ies) and the associated compliance schedule(s). S&L will assess the degree to which the GGS Unit 2 low NO_x project is a factor in the evaluation.
- Estimate each pollutant’s potential uncontrolled emissions and control technology reductions, and determine whether or not baseline emission data must be collected and whether air modeling is required. S&L will summarize the EPA rule and compliance requirements assessment in a screening matrix and white paper. Further analysis and design criteria preparation will follow the completion and NPPD review of the screening.
- Where required, prepare test plans for measuring baseline emissions for those pollutants that do not already have baseline emission data available.
- Prepare test plans for measuring control technology performance needed to determine the emission levels for air modeling input.
- Prepare air modeling input for pollutants.

S&L will also restart GGS MPCE engineering and proceed toward completing the project related specifications listed below based on the expectation that the minimum emission control technology will require activated carbon injection (ACI) for mercury control and flue gas

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desulfurization (FGD) for SO₂ and acid gas control. The NPPD procurement plan is currently under review.

- Wet FGD and Chimney, G-5301 (NOTE; consider whether the single flue chimney should be bid separately to ensure consideration of cold weather on concrete work schedule and both taper and silo style chimney designs, without EPC markup.)
- ID Fans and Motors, G-5303
- Material Handling, G-5307 (limestone and gypsum)
- ACI System, G-LATER
- Isolated Phase Bus Duct, G-5332
- Electrical Equipment Buildings, G-5331
- GWC, G-5310 (including structural steel, ductwork, substructure and critical foundations, miscellaneous pumps, balance of plant components, electrical work)
- BOP Buildings, G-5325
- Initial Site Work, G-5320

Summary sheets for specific S&L scope of work tasks included in the project suspension report that will be initiated or restarted to support design and procurement activities for the FGD system are attached. These tasks will be updated and expanded to include the ACI system.

S&L will also prepare a detailed cost estimate, annual cash flow and project schedule.

Scope of Work Options:

1. Study the feasibility of replacing the Unit 2 Rothmueller air heater with a Lungstrom air heater and interconnecting ductwork located adjacent to the existing gas path ductwork.
2. Complete the design of the Unit 2 hot-side ESP bypass.
3. Move forward with the design of the redundant 230 kV feed (this work had not been initiated prior to suspension).

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Summary sheets from the project suspension report for tasks related to the scope of work options are attached.

Sheldon Station Scope of Work

S&L will review the implications of the EPA proposed rules listed on the NPPD white paper Attachment A, including consideration of the Greenhouse Gas Tailoring rule, the proposed RCRA coal combustion residue rules, and any additional applicable rules. The scope of work will include a screening of the range of technologies applicable to each of the proposed rules and a rank order assessment of their cost effectiveness. The specific tasks that will be completed are as follows.

- Review each proposed rule and identify the technically feasible MPCE technology(ies) and the associated compliance schedule(s).
- Estimate each pollutant's potential uncontrolled emissions and control technology reductions, and determine whether or not baseline emission data must be collected and whether air modeling is required. S&L will summarize the EPA rule and compliance requirements assessment in a screening matrix and white paper. Further analysis and design criteria preparation will follow the completion and NPPD review of the screening.
- Where required, prepare test plans for measuring baseline emissions for those pollutants that do not already have baseline emission data available.
- Prepare test plans for measuring control technology performance needed to determine the emission levels for air modeling input.
- Prepare air modeling input for pollutants.

Following selection of the applicable MPCE technology (ies) for Sheldon Station, S&L will prepare detailed designs, procurement specifications, a detailed cost estimate, annual cash flow and project schedule.

GGS

Suspended Work Tasks

ATTACHMENT

12194-002

Date:12/30/2009

Nebraska Public Power District
Gerald Gentleman Station—Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist--

Phase: 2

Task Code: 100G10

Task Description: Implementation Schedule

Summary, as follows:

As documented in 12/17/09 email from Sarah Poole titled "NPPD U1&2 SCR-WFGD Implementation Schedule":

All,

Please see attached Units 1&2 SCR-WFGD Implementation Schedule updated per our discussions in 12/9/09 Chicago meeting.

Please note the following:

- I. The current schedule shows the WFGD permitting start (7/2009) late due to NPPDs request to have the permit in hand at the time of contract award. To have the permit in hand (8 or 9/2011) prior to construction start (10/2011) would required Prep of the Permit to start in 3/2010 to meet the 8/2011 date or 4/2010 to meet the 9/2011 date.
- II. The Unit 1 Chimney Shell (Jump Form) erection is from 7/2012 - 12/2012, this may encounter inclement weather.
- III. The Current Unit 1 construction schedule/sequence is based on crews not having to remobilize for major activities (critical foundations, chimney etc.). This leaves float before the Unit 1 2015 Tie-in Outage.
- IV. The Ductwork Erection for Unit 1 (dark green) has been staggered to follow the completion of Unit 2 (light green).

The SCR Construction Summary (by GWC) has increased for Unit 1 from 17 months to 18 months due to the slide in ductwork (see Note 4).

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Suspended Work Tasks

ATTACHMENT

12194-002

Date:1/5/2010

Nebraska Public Power District
Gerald Gentleman Station – Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist --

Phase: 2

Task Code: 111Y10

Task Description: Develop Conceptual Diagrams (BOP)

Summary, as follows:

The following BOP preliminary conceptual flow diagrams, GGS markup P&ID's, and preliminary P&ID have been developed as precursors to BOP system design P&ID preparation.

| <u>File Name</u> | <u>Flow Diagram Title</u> |
|-----------------------|--|
| MSK-ICD-0001 | Mechanical Systems Interconnect Diagram (VISIO) |
| U1 FGD P3-34 Sh 4 | Combustion Air, Coal & Flue Gas (VISIO) |
| U1 SCR P3-34 Sh 3 | Combustion Air, Coal & Flue Gas (VISIO) |
| U2 SCR P3-34 Sh 3 | Combustion Air, Coal & Flue Gas (VISIO) |
| Urea P3-XX Alt 1 | SCR Reagent Unloading, Storage & Distribution - Alt. 1 (VISIO) |
| Urea P3-XX Alt 2 | SCR Reagent Unloading, Storage & Distribution - Alt. 2 (VISIO) |
| FGD Waste P3-XX Alt 1 | FGD Waste Disposal – Alt. 1 (VISIO) |
| FGD Waste P3-XX Alt 2 | FGD Waste Disposal – Alt. 2 (VISIO) |
| SK-MU01 | Well Water & Makeup Water Supply (Microstation) |

| <u>File Name</u> | <u>Markup P&ID Title</u> |
|------------------|---------------------------------------|
| U1 P3-34 Sh 1 | Combustion Air, Coal & Flue Gas (pdf) |
| U2 P3-34 Sh 1 | Combustion Air, Coal & Flue Gas (pdf) |
| U1 P3-34 Sh 2 | Combustion Air, Coal & Flue Gas (pdf) |
| U2 P3-34 Sh 2 | Combustion Air, Coal & Flue Gas (pdf) |

Following project restart and review of the conceptual flow diagrams, system design P&ID's will be prepared for BOP piping systems. P&ID's (flow diagrams) for the material handling systems, SCR reagent equipment/skids, the FGD system, and the FGD waste water treatment system (if required) will be developed and furnished by the system vendors. Process flow sketches of the SCR reagent and FGD systems prepared for bid information are included with the Catalyst and FGD specification files, respectively.

Files of sketches listed below for the limestone and gypsum handling systems have been prepared for material handling specification bid information.

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Date:1/5/2010

| <u>File Name</u> | <u>Process Flow Sketch Title</u> |
|---------------------|--|
| GGSU0-MPCE-M9-1000 | Limestone Handling System (Microstation) |
| GGSU0-MPCE-M10-1000 | Gypsum Handling System (Microstation) |

GGS drawing numbers will be assigned in accordance with the S&L CAD plan and special attention to NPPD transmittal No. 278 describing the numbering convention for limestone and gypsum system flow diagrams. The conceptual flow diagrams already prepared are annotated to highlight open/followup issues and alternative design philosophies, where applicable.

Future work required as part of the system design P&ID development will include new diagrams, and markup revisions to existing GGS P&IDs for tie-in to and extension of interconnecting services identified on the mechanical systems interconnect diagram and noted below.

- Auxiliary Steam – Unit 1 & 2 steam system for the SCR sootblowers (if an alternative to compressed air) and urea unloading/dilution and hydrolizer equipment.
- Condensate or Demin Water – Unit 1 & 2 condensate or demin water system for urea dilution and urea system heating steam desuperheating.
- Potable Water – FGD lavatories, FGD facility eyewash and safety showers, SCR reagent system eyewash and safety showers.
- Compressed Air – Instrument air, service air, and sootblowing air (if an alternative to steam) for the SCR facility, material handling system, chimneys, and booster fans/dampers (NOTE: FGD supplier will provide instrument/service air compressors for FGD system including capacity for the BOP extension to each chimney).
- Service Water – SCR facility and limestone material handling system including dust mitigation (NOTE: FGD supplier will distribute provide FGD facility service/flush water system using Owner furnished makeup water).
- Equipment and Chemical Waste Drains – Segregated plant drains from equipment chemical and chemical storage areas routed to the neutralization basin.
- Oily Waste Drains – Segregated plant drains from oil containment areas routed to the oil water separator.
- Plant Drains (daylight) - Limestone/gypsum material handling/storage area drains and runoff routed to the storm water runoff pond.
- Plant Drains (reclaimable) – Condensate drains from the urea steam heating system and waste water treatment system (if required).
- Plant Drains –Roof and non-contact drains terminating at connections to the underground storm water drain system
- Vacuum Piping – Headers (including vacuum truck and hose connections) for vacuum cleaning of SCR catalyst levels and ash removal from ductwork through duct access doors.

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Date:1/5/2010

- Fire Protection – Potential backup source for the FGD system emergency quench.

The lists of existing GGS Unit 1 & 2 P&IDs are on each unit's Piping Symbols and Nomenclature drawing P1-1.

VISIO conceptual flow diagram files and pdf files of the markup P&IDs are located in DMS in the zip folder "GGG BOP FLOW DIAGRAMS.ZIP".

Microstation files are located in DMS according to their file name.

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Date:1/19/2010

Nebraska Public Power District
Gerald Gentleman Station – Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist --

Phase: 2

Task Code: 164Y3B

WBS Description: U1 & U2 Baghouse Outlet Ductwork Reinforcement

Task Description and ID: U1 & U2 Baghouse Outlet Ductwork Reinforcement
Calculations – S3

Summary, as follows:

Open Items:

- 1) The Baghouse Outlet Ductwork Assessment and Modification Calculation has not yet been completed.

Unverified Assumptions:

- 1) Ductwork Design Pressure & Temperature Profiles prepared by mechanical have been revised several times and were not finalized until just prior to project suspension.

Remarks:

- 1) The assement of the baghouse outlet ductwork is included in the calculation titled U1 and U2 Baghouse Outlet Ductwork Assessment and Modification Calculations (GGS-U1-MPC-S003). The calculation has not been completed and it is scanned and stored in DMS under 5.0 Calculations\ 5.06 Structural. The hard copy of the calc is stored in file room 21O09.
- 2) Reinforcement evaluation was on HOLD pending final pressure & temperature profile. An initial assessment of the duct plate and stiffeners on the Unit 1 ductwork sections 1C6, 1C7, and 1C8 has been performed to estimate the amount of reinforcement that would be required.

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12194-002

Date:1/5/2010

Nebraska Public Power District
Gerald Gentleman Station – Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist --

Phase: 02

Task Code: 200G30

Task Description: Calculations & Preliminary Design

Summary, as follows:

Unit 1 & 2 Flue Gas Duct Pressure Profile (Calc. No. GGS-U1-MPC-M003):

This calculation developed the tool for determining duct pressure profiles for a range of operating conditions with the specific objective of generating input for the NFPA 85 compliance assessment (Phase 2 Task Code 420MFP), structural design and assessment of ducts and equipment, operating impacts on the existing ID fans, and the design criteria for the new ID booster fan (Phase 5 Task Code 205M070323).

Maximum normal and design load case definitions and flue gas path infiltration rates recommended in NPPD Transmittal 204 (draft, dated 9/29/09) were incorporated into the flue gas duct pressure profile calculation. The duct pressure profile and ID fan inlet conditions at maximum normal and design load cases issued to NPPD 12/30/01 (NPPD-SL-0261) will be reviewed after purchasing the catalyst system and completing the flow modeling study.

A final review and update of S&L calculation GGS-U1-MPC-M003 is required to develop booster fan design and performance bid data for specification G-5303.

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Suspended Work Tasks

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Date:1/14/2010

Nebraska Public Power District
Gerald Gentleman Station--Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist--

Phase: 2

WBS Code: 200G30

WBS Description: Calculations & Preliminary Design

Task Description and ID: Survey Package--S19

Open Items:

None.

Remarks:

1. NPPD Transmittal 155 & 155A contain benchmark information from NPPD requested by S&L per S&L RFI 035.
2. S&L Transmittal NPPD-SL-0188 requested surveyed coordinate information from several locations around the plant site. The results of this survey were transmitted to S&L via NPPD Transmittal 218.
3. S&L needs to review and process the survey results. There are known tie-in issues with the baghouse project ductwork. See S&L Action item 09 0334. The survey package files are stored in DMS under 5.0 Calculations \ 5.06 Structural.

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Suspended Work Tasks

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Date:1/14/2010

Nebraska Public Power District
Gerald Gentleman Station – Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist --

Phase: 2

Task Code: 400Y10

Task Description: Mechanical Design Criteria

Summary, as follows:

The mechanical design criteria document was issued to NPPD for information on 1/13/10, via transmittal letter NPPD-SL-0274.

Document Status

Design basis and criteria has been recorded for mechanical systems and equipment which was the responsibility of S&L. A few open issues that will need to be revisited are noted below:

1. Regarding make-up water quality, revisit any equipment that can cycle concentration of silica. The make-up water analysis showed that the concentration of silica present was 50 ppm. Since it is common practice with cooling towers to limit the silica present to 150 ppm, any process that can increase the silica concentration by a factor of three or more (other than in the absorber, itself), whether in the mist eliminators, new auxiliary cooling tower (if applicable) or other process may need to be reviewed and some remedial measures (e.g. anti-scalants, more frequent cleanings, etc.) may need to be implemented. Refer to email from M. Rosen to W. Patel dated 11/23/09.
2. Evaluate using VFDs on the feed pumps of the Urea to Ammonia conversion system.
3. Verify low pressure steam source for supply to the SCR reagent conversion equipment (process heaters and hydrolyzers).
4. Add criteria for HVAC procured for this project on the WFGD and the chimney.
5. Update with any client criteria for general mechanical equipment, such as piping, valves, pumps, tanks, expansions joints, etc. Criteria from the Beatrice plant may be reviewed for this.

This document is used as a compilation of the project mechanical design criteria. Since several tasks were being performed in parallel, tables within the criteria document should be updated with the latest information from the following tasks:

1. NFPA 85 study and fan sizing calculation and flue duct pressure drop calculation.

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Suspended Work Tasks

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Date:1/14/2010

2. Latest mass balance calculation.
3. Latest SCR design basis calculation.
4. Latest list of mechanical system codes.

File Information

The mechanical design criteria working files (WORD file and PDF attachments) can be located in folder 6.02 on DMS.

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12194-002

Date:1/18/2010

Nebraska Public Power District
Gerald Gentleman Station – Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist --

Phase: 4

Task Code: PMCMFG

Task Description: Wet FGD Spec Prep

Summary, as follows:

- General: All sections returned to S&L from NPPD on December 3, 2009 have been reviewed and editorial comments have been incorporated. Open items and individual specification status are identified on a separate spreadsheet. These sections have been revised to Rev. 02.
- Editorial comments that were track changed in section 441130 were accepted and questions were consolidated onto an excel spreadsheet (Section 441130 Questions). These questions have not been resolved and therefore are still shown as track changes in the wet FGD section 441130.
- It should be noted that the wet FGD specification is based on the following design conditions:
 - Belt Filter to dewater to 90% solids
 - 12,000 ppm Cl equilibrium
 - Wastewater treatment system required (separate specification)
- A materials of construction for the absorber white paper, gypsum dewatering options white paper and wastewater treatment white paper were developed in December of 2009. However, the FGD specification was not finalized. These items will need to be finalized when the project starts up again.
- The following sections would also will need to be finalized:
 - Section 011100 Summary of Work & General Requirements
 - Section 012513 Acceptable Suppliers and Product Substitutions
 - Proposal Data
 - Proposal Pricing
 - Reference Drawings (Section I Drawings and Data Requirements)

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Suspended Work Tasks

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Date:1/18/2010

- PFD's (Wet FGD Drawings – 11-10-09) were developed during the time that NPPD was commenting on the specification. They are based on the design conditions stated above as well as the performance of the current specification. They would need to be modified if different design conditions (i.e. Stebbins v. alloy, gypsum stack v. belt filter, etc...) or redundancy requirements were needed.
- NPPD Transmittal 225 was a response that authorized S&L to add language in the specification to include the supply of belt filters that incorporate chloride wash/removal equipment. This has not been incorporated.
- Items that S&L has incorporated into the specification:
 - Updated the table in Section 441130 that defines the operating conditions to reflect URGE conditions and the 0.75% sulfur “design” fuel analysis.
 - Updated the definition of “design” fuel analysis from 1.0% to 0.75% sulfur which is a more likely fuel.
 - Updated the definition of URGE load and deleted any reference to MCR.
 - Deleted the “performance” fuel analysis based on NPPD and S&L discussions.
 - Updated the number of hot and cold starts.

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Suspended Work Tasks

ATTACHMENT

12194-004

Date:1/5/2010

Nebraska Public Power District
Gerald Gentleman Station – Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist --

Phase: 004

Task Code: PMFM070323

Task Description: ID Booster Fans & Motors Specification (G-5303)

Summary, as follows:

Ref. Suspension Task Status Summary for 205M070323, Booster Fan Sizing Calculation.

NPPD verbally indicated that no comments were being returned on Spec G-5303.

The preliminary booster fan design test block conditions for Units 1 and 2 based on S&L calculation No. GGS-U1-MPC-M004 are summarized below.

Design Test Block (Maximum Heat Input)
(per fan)

| Design Parameter | units | Unit 1 | Unit 2 |
|---------------------|-------|-----------|-----------|
| Mass Flow | lb/hr | 4,607,250 | 5,006,230 |
| Volume Flow | acfm | 1,829,975 | 1,929,795 |
| Temperature | deg F | 337.5 | 312.5 |
| Fan Inlet Pressure | "wg | -20.55 | -21.21 |
| Fan Outlet Pressure | "wg | 14.59 | 14.19 |

These conditions are based on operating the existing ID fans at their current maximum capability at the maximum boiler heat input load case. Prior to issuing the specification for bid, NPPD shall confirm whether to investigate matching the ID and booster fan design capacities based on the use of interchangeable rotors (which would require upgrading the existing ID fans). Booster fan performance data at maximum normal continuous (MNC) load and at partial loads such as 75% MNC and 50% MNC need to be included in the specification.

GG5

Suspended Work Tasks

ATTACHMENT

12194-004

Date:1/4/2010

Nebraska Public Power District
Gerald Gentleman Station—Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist--

Phase: 4

Task Code: PSCC00

Task Description: Specification G-5322 Substructure & Critical Foundations-S31

INCLUDE IN GWC SPEC

Summary, as follows:

Eleven (11) technical sections are required for the substructure & critical foundation specification. Six (6) technical sections are common with other specifications. Two (2) technical sections will be prepared later.

Group 1 technical sections were transmitted for NPPD comments with Specification G-5322. There are no open items for Sections 311101 and 316201. Section 316316 has one open item: Article 104.1-finalize the reference for logs of the existing soil borings.

Group 2 technical sections were transmitted to NPPD for comments with Specification G-5321, Electrostatic Precipitator Demolition. Group 2 technical sections have no open items.

Group 3 technical sections have been reviewed by NPPD with Specification G-5301. Revised sections were transmitted to NPPD with Specification G-5301. Open items for Sections 033115, 050525 and 099113 are noted with Specification G-5301.

Group 4 technical sections will be prepared later.

Group 1

Section 311101, Site Clearing and Grubbing

Section 316201, Pile load testing

Section 316316, Auger Cast Grout piles

Group 2

Section 014398, Earthwork Testing

Section 050530, Anchor rods

Section 312316, Excavation and backfill for foundations

Group 3

Section 033115, Concrete work

Section 050525, Structural welding

Section 099113, Coating systems

Group 4

Section xxxx for grounding, embedded conduit and other applicable electrical sections

Section xxxx for embedded piping (e.g. roof drains and other applicable mechanical sections)

GGGS

Suspended Work Tasks

ATTACHMENT

12194-004

Date:1/4/2010

Nebraska Public Power District
Gerald Gentleman Station – Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist --

Phase: 4

Task Code: PSFM211010

Task Description: Specification G-5324 Ductwork Fabrication and Erection-S33

INCLUDE IN GWC SPEC

Summary, as follows:

Seven (7) technical sections are required for the ductwork supply and erection specification. All seven (7) technical sections are common with other specifications.

Group 1 technical sections were transmitted to NPPD for comments with Specification G-5321, Electrostatic Precipitator Demolition. Sections 051810A and 051825 have no open items. Section 051800A has the following open items:

1. Article 104.3: review method of weld examination in addition to visual for complete penetration and seal welds.
2. Article 201.1: finalize material for SCR girders
3. Article 303.2: review method of weld examination in addition to visual for complete penetration welds.
4. Table 051800.1: add final temperatures and pressures

Group 2 technical sections have been reviewed by NPPD with Specification G-5301. Revised sections were transmitted to NPPD with Specification G-5301. Open items for Sections 050525 and 099113 are noted with Specification G-5301.

Group 3 technical sections will be prepared later.

Group 1

Section 051800A, ductwork fabrication
Section 051810A, ductwork erection
Section 051825, slide bearing plates

Group 2

Section 050525, structural welding
Section 099113, coating systems

Group 3

Section 051820, ductwork expansion joints
Section 072115, ductwork insulation and lagging

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Suspended Work Tasks

ATTACHMENT

12194-004

Date:1/4/2010

Nebraska Public Power District
Gerald Gentleman Station – Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist --

Phase: 4

Task Code: PSFS2010

Task Description: Specification G-5323 Structural Steel Fabrication and Erection-S34 INCLUDE IN GWC SPEC

Summary, as follows:

Nine (9) technical sections are required for structural steel fabrication and erection. All nine (9) technical sections are common with other Specifications.

Group 1 technical sections were transmitted to NPPD for comments with Specification G-5321, Electrostatic Precipitator Demolition. There are no open items for the Group 1 technical Sections.

Group 2 technical sections have been reviewed by NPPD with Specification G-5301. Revised sections were transmitted to NPPD with Specification G-5301. There are no open items for Sections 036241 and 050538. Open items for Sections 050525 and 099113 are noted with Specification G-5301.

Group 1

Section 051223A, Structural steel fabrication
Section 051224A, Structural steel erection
Section 050523A, Bolting
Section 055140A, Gallery Work
Section 050530, Anchor rods

Group 2

Section 050525, Structural welding
Section 036241, Grout work
Section 050538, Post-installed concrete anchors
Section 099113, Coating systems

GGS

Suspended Work Tasks

ATTACHMENT

12194-005

Date:1/5/2010

Nebraska Public Power District
Gerald Gentleman Station – Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist --

Phase: 05

Task Code: 205M070323

Task Description: Booster Fan Sizing Calculation (Calc. No. GGS-U1-MPC-M004)

Summary, as follows:

Ref. Suspension Task Status Summary for 200G30, Calculations & Preliminary Design, Units 1 & 2 Flue Gas Duct Pressure Profile.

New booster fans are required to increase the flue gas system total pressure at the flue gas design flows to offset the pressure losses due to the addition of the SCR and FGD equipment.

The Unit 1 & 2 flue gas duct pressure profile calculation (Calc. No. GGS-U1-MPC-M003) and existing ID fan performance curves are the primary analytical inputs for calculating the booster fan inlet conditions. Booster fan outlet conditions are based on experience-based, unverified assumptions for pressure loss through a wet FGD system. The booster fan inlet and outlet design conditions will be reviewed after purchasing the catalyst and FGD systems and completing flow modeling studies.

Maximum continuous normal (MNC) load and maximum heat input load pressure profiles from the ID fan inlet through the chimney inlet issued to NPPD 12/31/09 (NPPD-SL-0262) illustrate maximum normal operating and design requirements for the new booster fan. At MNC load the ID and booster fan operating conditions are nearly identical. At boiler maximum heat input the existing ID fans' performance is restricted by their test block total pressure curves. If "identical" ID and booster fan rotor designs are specified, further investigation would be required to determine whether the existing ID fans could be modified to increase their test block capability, if practicable based on the ID fan aux power system capacity.

A final review and update of S&L Calc. No. GGS-U1-MPC-M004 is required to develop booster fan design and performance bid data for specification G-5303, ID Booster Fans.

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Suspended Work Tasks

ATTACHMENT

12194-005

Date:1/4/2010

Nebraska Public Power District
Gerald Gentleman Station – Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist --

Phase: 5

WBS Code: 412M51

WBS Description: U1&2 Existing Pipe Rack & Foundation Detailed Design

Task Description and ID: U1 Pipe Rack – Steel drawings, Foundation drawings and Calculations – S49

Open Items:

- 1) The piping analysis was not complete at the time of pipe rack steel and foundation design. The piping loads applied on the structure were based on S&L structural design standard E5. This input shall be verified when piping design data becomes available.
- 2) The existing 12" steam line has an anchor support on the ESP support steel. Since this steel will be demolished, a new support configuration was created. A piping analysis was not done to determine the loads at the anchor. Therefore, the new support was designed to match the stiffness of the existing support configuration. The new anchor support should be checked after the piping design data becomes available.

GGS

Suspended Work Tasks

ATTACHMENT

12194-005

Date:1/4/2010

Nebraska Public Power District
Gerald Gentleman Station—Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist--

Phase: 5

WBS Code: 412M51

WBS Description: U1&2 Existing Pipe Rack & Foundation Detailed Design

Task Description and ID: U2 Pipe Rack—Steel drawings, Foundation drawings and Calculations—S50

Open Items:

- 1) The FGD piping analysis was not complete at the time of pipe rack steel and foundation design. The piping loads applied on the structure were based on S&L structural design standard E5. This input shall be verified when piping design data becomes available.
- 2) The FGD piping may have an anchor support on the structural steel in the future. Without a piping analysis, any loads applied to the structure to try to envelope an anchor support would be too conservative. Therefore, the vertical bracing ICs in the area of the FGD piping is kept low to allow for the future anchor support. Local modifications, such as an addition of a truss, may be required at future anchor support.
- 3) The FGD cable tray layout was not finalized at the time of pipe rack steel and foundation design. The cable tray sizes were conservatively assumed and loads were applied based on S&L structural design standard E5. This input shall be verified when cable tray layout is finalized.
- 4) The existing piping support locations and reactions were not available at the time of pipe rack steel and foundation design. The piping loads applied on the structure were based on S&L structural design standard E5. Also, the piping support locations were conservatively assumed. This input shall be verified when piping design data becomes available.
- 5) The pipe rack foundation design was based on the preliminary geotechnical design criteria. This design input shall be verified when the preliminary geotechnical design criteria is validated.

GGS

Suspended Work Tasks - Optional Scope

ATTACHMENT

12194-002

Date:1/4/2010

Nebraska Public Power District
Gerald Gentleman Station – Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist --

Phase: 2

Task Code: 200G30

WBS Description: Calculations and Preliminary Design

Task Description and ID: U2 Air Heater, ESP, & ESP Bypass Structural Steel
Assessment & Modifications, Calculations and Drawings – S8

Summary, as follows:

Open Items:

- 1) N/A

Unverified Assumptions:

- 1) Ductwork Design Pressure & Temperature Profiles prepared by mechanical have been revised several times and have not yet been finalized.
- 2) 2H2 & 2H8 ductwork damper weights and unbalanced pressure loads. See S11 and S12 for further explanation.

Remarks:

- 1) The calculation is titled Existing Air Heater & Precipitator Structural Steel Assessment & Modification Calculations (GGS-U2-MPC-S001). The calculation is scanned and stored in DMS under 5.0 Calculations\ 5.06 Structural. The calculation is stored in file room 21O09.
- 2) The existing and modified air heater support steel was tied to the existing by-pass duct support steel to jointly resist the lateral loads from wind and unbalanced pressure.
- 3) New posts have been added to the structure to support the new ductwork. In order to avoid having these posts go to grade and block an existing roadway, the existing air heater steel was tied to column row Vt of the ESP support steel in order to support the posts.
- 4) The unbalanced pressure loads were based on the values in the study report, which are conservative to the final pressure profile calculation. The conservatism is deemed acceptable as the construction penalty is small by engineering judgment.

GGS

Suspended Work Tasks - Optional Scope

ATTACHMENT

12194-002

Date:1/4/2010

- 5) The positive excursion pressure & temperature of +27" @ 900 Deg F as used for the baghouse project needs to be confirmed.
- 6) See tasks S22 & S23 for trolley beams and gallery work.

GGGS

Suspended Work Tasks - Optional Scope

ATTACHMENT

12194-002

Date:1/4/2010

Nebraska Public Power District
Gerald Gentleman Station--Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist--

Phase: 2

Task Code: 200G30

WBS Description: Calculations and Preliminary Design

Task Description and ID: Existing 2H2 Precipitator Bypass Ductwork Assessment & Modifications - S12

Summary, as follows:

Open Items:

- 1) Confirmation of positive excursion pressure.
- 2) Discuss expansion joint details with NPPD. NPPD would like to reuse the existing frames and hardware; however, they are purchasing new belt material. Need to inventory what hardware they actually have so expansion joint vendor knows exactly what he needs to provide.

Unverified Assumptions:

- 1) Ductwork Design Pressure & Temperature Profiles prepared by mechanical have been revised several times and have not yet been finalized.
- 2) Ductwork Damper Weights (120 Kips and 60 Kips Assumed).

Remarks:

- 1) The assessment of the 2H4 ductwork is in the calculation titled Existing 2H2 Precipitator Bypass Ductwork Assessment & Modifications (GGGS-U2-MPC-S004). The calculation is completed and it is scanned and stored in DMS under 5.0 Calculations\ 5.06 Structural. The calc is stored in file room 21009.
- 2) The positive excursion pressure & temperature of +27" @ 900 Deg F as used for the baghouse project needs to be confirmed.
- 3) Damper Weights and unbalanced pressure loads have been applied to the 2H2 ductwork to account for the future possibility of SCR Bypass dampers. Vertical dead load of 120 kips for the 41ft x 28ft damper, a vertical load of 60 kips for the two 20.5ft x 28ft dampers, and calculated horizontal unbalanced pressure loads that account for both flue gas paths, have been applied to the duct. The damper

GGS

Suspended Work Tasks - Optional Scope

ATTACHMENT

12194-002

Date:1/4/2010

weights were estimated base on prior project experience. The assumed weight of the dampers needs to be confirmed.

GGGS

Suspended Work Tasks - Optional Scope

ATTACHMENT

12194-002

Date:1/4/2010

Nebraska Public Power District
Gerald Gentleman Station--Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist--

Phase: 2

Task Code: 200G30

WBS Description: Calculations and Preliminary Design

Task Description and ID: Existing 2H4 Precipitator Bypass Ductwork Assessment & Modifications - S13

Summary, as follows:

Open Items:

- 1) Confirmation of positive excursion pressure.
- 2) Discuss expansion joint details with NPPD. NPPD would like to reuse the existing frames and hardware; however, they are purchasing new belt material. Need to inventory what hardware they actually have so expansion joint vendor knows exactly what he needs to provide.

Unverified Assumptions:

- 1) Ductwork Design Pressure & Temperature Profiles prepared by mechanical have been revised several times and have not yet been finalized.

Remarks:

- 1) The assessment of the 2H4 ductwork is in the calculation titled Existing 2H4 Precipitator Bypass Ductwork Assessment & Modifications (GGGS-U2-MPC-S005). The calculation is completed and it is scanned and stored in DMS under 5.0 Calculations\ 5.06 Structural. The calc is stored in file room 21O09.
- 2) The positive excursion pressure & temperature of +27" @ 900 Deg F as used for the baghouse project needs to be confirmed.

GGS

Suspended Work Tasks - Optional Scope

ATTACHMENT

12194-002

Date:1/4/2010

Nebraska Public Power District
Gerald Gentleman Station—Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist--

Phase: 2

Task Code: 200G30

WBS Description: Calculations and Preliminary Design

Task Description and ID: Existing 2H1 & 2H3 Precipitator Bypass Ductwork
Assessment & Modifications - S14

Summary, as follows:

Open Items:

- 1) Confirmation of positive excursion pressure.
- 2) Discuss expansion joint details with NPPD. NPPD would like to reuse the existing frames and hardware; however, they are purchasing new belt material. Need to inventory what hardware they actually have so expansion joint vendor knows exactly what he needs to provide.

Unverified Assumptions:

- 1) Ductwork Design Pressure & Temperature Profiles prepared by mechanical have been revised several times and have not yet been finalized.

Remarks:

- 1) The assessment of the 2H1 and 2H3 ductwork is in the calculation titled Existing 2H1 & 2H3 Precipitator Bypass Ductwork Assessment & Modifications (GGS-U2-MPC-S006). The calculation is completed and it is scanned and stored in DMS under 5.0 Calculations\ 5.06 Structural. The calc is stored in file room 21O09.
- 2) The positive excursion pressure & temperature of +27" @ 900 Deg F as used for the baghouse project needs to be confirmed.
- 3) No reinforcement is anticipated. Hence, other than the calculation, there is no deliverable for this task.

GGS

Suspended Work Tasks - Optional Scope

ATTACHMENT

12194-002

Date:1/4/2010

Nebraska Public Power District
Gerald Gentleman Station--Units 1&2
MPCE Study

-- Project Suspension Task Status Summary/Punchlist--

Phase: 2

WBS Code: 200G30

WBS Description: Calculations and Preliminary Design

Task Description and ID: Existing 2H1 Ductwork Support Steel Reinforcement

Walkdown--S15

Open Items:

- 1) During the Baghouse Project, the 2H1 ductwork support steel was assessed and reinforcement was designed. Some reinforcement was not constructed. A walkdown was done to determine the extent of the constructed reinforcement. Dec 2008 walkdown notes and sketches are available showing the in-place reinforcements.
- 2) A drawing showing which reinforcement was installed during the Baghouse Project was not created.
- 3) RFI - 047 was submitted to NPPD to confirm whether the material for structural steel modifications/reinforcements not installed during the Baghouse Project was procured and inventoried at the site. NPPD confirmed that the material was procured, stored and inventoried. Spreadsheets of material inventory were sent to S&L via NPPD transmittal 183. NPPD recommended that during a planned site visit, S&L should also verify the inventory. Further discussions with NPPD will be necessary in order to determine an appropriate course of action for proceeding with the installation of the remaining modifications.

DRAFT

Multi-Pollutant Control Equipment (MPCE) Planning Efforts

For

Gerald Gentleman Station and Sheldon Station

1. Background

With EPA's issuance of the proposed Utility Boiler MACT rule and the imminent issuance of additional proposed rules, a decision was made to continue previous MPCE planning efforts for Gerald Gentleman Station (GGS) and initiate similar planning efforts for Sheldon Station (SS). The planning efforts will be pursued as two projects, one each for GGS and SS. The intent of this white paper is to describe at a high level the actions that need to be taken in the near-term to initiate the planning efforts. Since Sargent & Lundy (S&L) was involved in the GGS planning efforts to date, their services will be solicited to provide assistance in accomplishing these efforts for both stations.

It should be noted that the emphasis for the planning efforts described herein has changed somewhat from the previous efforts. In general, the previous efforts were focused on determining the complement of MPCE that would be needed at GGS to implement Best Available Control Technology (BACT) for selected criteria pollutants. With the number of proposed rules that are either in process or anticipated at the current time, the focus from this point forward will be to:

- a. Identify the list of the applicable proposed rules (collectively referred to herein as the "proposed rules", which are listed in Attachment A).
- b. Evaluate the impact of them on GGS and SS. This will necessitate some analysis and may require associated modeling and actual field testing.
- c. Select the appropriate pollution control technology, or technologies, based on the results of the evaluations.
- d. For the selected technology (ies), perform detailed engineering and planning efforts to implement them.

It is expected that the evaluation of the various proposed rules will show an overlap of requirements and that there will be a limited number of technologies that will be needed at each station to meet them.

The details of longer-term actions (after June 2011) will be identified after the near-term actions have been initiated and are underway.

2. Near-Term Actions (to be accomplished by the end of the Spring 2011 GGS and SS outages)

- a. Update / Initiate the MPCE Project Charters and Project Plans for each station:
 - i. Identify project planning objectives to include the following, at a minimum:
 - 1. For each station, evaluate the implications of the proposed rules and options for meeting the associated requirements.
 - 2. For GGS, verify the full complement of pollution control equipment that will be required while continuing with past engineering and planning efforts to refine the design and develop contract documents for wet flue gas desulfurization (FGD) and related equipment. Should the need for additional equipment arise, it will be added to the scope.
 - 3. For SS, evaluate the most cost-effective pollution control technologies, select the best one(s), and then proceed with detailed design and contract document development activities for the selected technology (ies).
 - ii. Establish the near-term MPCE project team for each station.
 - iii. Identify deliverables and milestone schedule for each project.
 - iv. Develop and obtain approval for the budget for the identified scope of work for each project.
- b. Bring Sargent & Lundy on board
 - i. GGS Scope of Work:

For GGS, S&L is expected to approach the work in two parallel paths: (1) Develop a comprehensive plan for the analysis, modeling, and testing efforts to determine implications of the proposed rules, and (2) Reinitiate the previous GGS MPCE engineering and planning work. To this end, S&L will develop a detailed proposal for both work scopes to cover the involved activities through issuance of the MPCE contract documents for

bid / negotiation. The objective is to be ready to launch into detailed analysis and engineering activities at the conclusion of the GGS Unit 1 Spring Outage, which is currently scheduled to be completed in early June. To support this objective, the detailed proposal would be needed by mid-May 2011 such that it could be taken to the June 2011 Board Meeting for authorization. The following assumptions and needs will be used in developing the proposal:

- a. The S&L Project Suspension Report dated January 15, 2010, will be used as the starting point for identifying the work completed to date and the remaining engineering and planning scope of work.
- b. The proposed S&L team will include as many previous key team members as is possible to keep the learning curve for this effort as short as possible. S&L has been contacted and these team members are available in the near-term.
- c. S&L should evaluate the implications of the proposed rules for both GGS units by developing a detailed analysis, modeling and testing plan. The plan should include a validation of the listing of proposed rules provided by NPPD as Attachment A to this white paper and identify any additional applicable rules, as well as any on the list that may not be applicable. Once the listing has been validated, the associated requirements must be tabulated and analyzed to determine how best to meet them. It is expected that some level of modeling and actual field testing may be required to complete this evaluation. All work associated with this item should be included in the plan.
- d. While this analysis work is proceeding and in the interest of time, the reinitiating of the previous engineering and planning work should proceed. It should be assumed that the minimal MPCE scope will include Activated Carbon Injection (ACI) for mercury control, and wet Flue Gas Desulfurization (FGD) for SO₂ and acid gas control for each GGS unit. The final selected complement of equipment will depend on the completion of the aforementioned evaluation plan.
- e. Given the time frames involved (potentially only three years from November 2011 for compliance with the Utility Boiler MACT rule), it should also be assumed that a single EPC contract will be used for wet FGD islands and chimneys for

both units, and that other specific contracts, including a General Works Contract, will be used for the remaining activities.

- f. The desired schedule is to have all of the contract documents ready for issue/negotiation by end of 2011. Note that authorization to use the EPC contract will require the use of an Engineer's Certificate to be authorized by the Board. Since this instrument typically requires three months to process, it needs to be started no later than October 2011, and the detailed engineering and planning will need to be sufficiently completed by that time to support it.
- g. Since the proposed Utility Boiler MACT rule apparently contains requirements for using combustion tuning (optimization) as an acceptable control mechanism for dioxins and furans, S&L should include engineering services to review the project that is already underway for combustion optimization for both GGS units. The purpose of this review is to ensure that the intended scope of the ongoing project will suffice to meet the combustion tuning requirements of the proposed rule.
- h. Based on previous work, and the completion of the evaluation plan noted above, S&L should develop a detailed cost estimate and schedule for the entire project by August 2011. This cost estimate and schedule will be used to obtain overall funding for the project.

ii. Sheldon Station Scope of Work:

For SS, S&L is expected to develop a comprehensive plan for the analysis, modeling, and testing efforts to determine implications of the proposed rules and then follow basically the same path as for GGS through issuance of the MPCE contract documents for bid / negotiation. Again, the objective is to be ready to launch into detailed analysis and engineering activities after the SS Spring outage, which is currently scheduled to be completed in April. To coordinate the S&L start with the GGS work, the detailed proposal would also be needed by mid-May 2011 such that it could be taken to the June 2011 Board Meeting for authorization. The following assumptions and needs will be used in developing the proposal:

- a. S&L should evaluate the implications of the proposed rules for both SS units by developing a detailed analysis, modeling and testing plan. The plan should include a validation of the listing of proposed rules provided by NPPD as Attachment A to this white paper and identify any additional applicable rules, as well as any on the list that may not be applicable. Once the listing has been validated, the associated requirements must be tabulated and analyzed to determine how best to meet them. It is expected that some level of modeling and actual field testing may be required to complete this evaluation. All work associated with this item should be included in the detailed plan. It should be noted that, given the size and age of the SS units, wet or dry scrubbers may not be the optimum selection to meet the requirements of the proposed rules. Other technologies identified in the Utility Boiler MACT Rule, like Dry Sorbent Injection (DSI), may suffice. S&L should include an evaluation of the cost-effective alternatives and a recommendation for the optimum equipment for both SS units to be able to meet all of the requirements of the proposed rules.
- b. Once the technology (ies) has (have) been selected, S&L should perform detailed engineering and planning to support development of the necessary contract documents for implementation.
- c. The desired schedule is to have all of the contract documents ready for issue by mid-2012. This should allow ample time for implementation to meet the expected compliance dates of the proposed rules.
- d. Since the proposed Utility Boiler MACT rule apparently contains a requirement for using combustion tuning (optimization) as an acceptable control mechanism for dioxins and furans, S&L should also include engineering services to review the ability of both SS units to meet this specific requirement of the rule and make recommendations for any changes that may be necessary.
- e. Based on these assumptions, an updated, S&L should develop a detailed cost estimate and schedule for the entire project by

September 2011. This cost estimate and schedule will be used to obtain overall funding for the project.

3. Longer-Term Actions (after 6/2011):

This white paper will be updated to address the longer-term actions after the near-term actions have been agreed to and are underway.

April 7, 2011

Attachment A

EPA Proposed Rules

The rules proposed by the EPA that are to be evaluated by Sargent & Lundy (S&L) for implications at both Gerald Gentleman Station (GGS) and Sheldon Station (SS) are listed below. Additional information regarding each proposed rule is also provided.

1. NO2 NAAQS

- a. This rule is now final.
- b. Modeling is required to show compliance with this rule.
- c. Since definitive guidance for how the modeling must be done has not yet been provided, some assumptions must be made.
- d. It is assumed that S&L would assist with developing the assumptions and HDR would do the actual modeling.

2. SO2 NAAQS

- a. This rule is now final.
- b. Modeling is required to show compliance with this rule.
- c. Since definitive guidance for how the modeling must be done has not yet been provided, some assumptions must be made.
- d. SS could not meet this rule at the present time. SS is up to three times the limit now. If SO2 at SS could be reduced to 0.2 lb/mmBtu, the limits of the rule might be met.
- e. GGS is presently permitted at 1.2 lb/mmBtu SO2. At this level, the requirements of this rule would not be met. At our current actual emissions rate of 0.6 lb/mmBtu, we might be able to meet the limits of this rule. If SO2 could be reduced to 0.2 lb/mmBtu (per the limits contained in the Mercury/Utility Boiler MACT Rule), the limits of this rule would be met.
- f. Must be in compliance with this rule by January 2017.

3. Clean Air Transport Rule

- a. The requirements of this proposed rule were finalized in June 2011.
- b. The State of Nebraska is included in this rule and it contains requirements for SOx and NOx.
- c. It is currently proposed as a "Cap and Trade" rule.
- d. Its requirements were based on the old NAAQS numbers. When the newly proposed NAQQS numbers go into effect, the requirements of this rule will be worse due to the "ratcheting" effect.

4. Mercury/Utility Boiler MACT Rule

- a. As stated in the associated white paper, S&L is to evaluate all of the requirements of this proposed rule for both GGS and SS.

5. PM 2.5 NAAQS

- a. If a “control device” is added to either station, this proposed rule may come into play.
- b. Does S&L have any ideas on how to address this?

6. Ozone NAAQS

- a. This proposed rule will have an impact on the NO_x provisions of the proposed Clean Air Transport Rule.
- b. When contemplating future options for dealing with NO_x at either station, this proposed rule needs to be considered.
- c. Does S&L have any ideas on how to address this?

7. 423 Water Effluent Standards

- a. The requirements of these proposed standards specifically target scrubber liquid waste disposal.